WHAT IS CLAIMED IS:

1. A switching system having an input and an output, the switching system further comprising:

a first communications switch and a second communications switch connected by at least one communications link, comprising at least one channel, for transmitting a plurality of data units through said communications link to the output of the switching system;

a common time reference (CTR);

wherein each of the communications switches is further comprised of a plurality of input ports and a plurality of output ports, each of the input ports connected to and receiving data units from the communications link over at least one of the channels, and each of the output ports connected to and transmitting data units to the communications link over at least one of the channels;

wherein each of the communications switches has a switch controller, coupled to the CTR, the respective input ports, and the respective output ports;

wherein each of the communications switches has an optical interconnection system coupled to the respective switch controller, the respective input ports, and the respective output ports;

wherein the CTR is divided into a plurality of contiguous periodic super cycles (SCs) each comprised of at least one time cycle (TC) each comprised of at least one time frame (TF);

wherein each of the switch controllers defines the coupling from each one of the respective input ports for data units received during any one of the time frames, on a respective one of the channels, for output during a predefined time frame to at least one

selected one of the respective output ports on at least one selected respective one of the channels; and

wherein each of the switch controllers is responsive to the CTR for configuring the optical interconnection system wherein the optical interconnection system is coupled to the input ports via a wavelength conversion subsystem.

2. The system as in claim 1,

wherein the data units that are output during a first predefined time frame on a selected respective one of the channels through the respective output port of the first communications switch are forwarded through the respective output port of the second communications switch during a second predefined time frame on a selected respective one of the channels responsive to the CTR.

3. The system as in claim 1,

wherein the optical interconnection system is further comprised of at least one of the following:

a plurality of star couplers, a plurality of tunable receivers, a plurality of lasers, and a plurality of WDM MUXs;

wherein each of the switch controllers is responsive to the CTR for tuning the tunable receivers for receiving data units on a predefined optical channel.

4. The system as in claim 3,

wherein the communications links are coupled to the star couplers;

wherein the star couplers are coupled to the tunable receivers;

wherein the tunable receivers are coupled to the lasers; and

wherein the lasers are coupled to the WDM MUXs.

5. The system as in claim 3,

wherein the communications links are divided into a plurality of subsets;

wherein each of the subsets of the communications links are coupled to each of the star couplers.

6. The system as in claim 5,

wherein the subsets of the communications links are mutually exclusive.

7. The system as in claim 3,

wherein each star coupler has a plurality of outgoing optical links;

wherein each of said outgoing optical links are connected to a selected one of the tunable receivers.

8. The system as in claim 3,

wherein each of the WDM MUX has a plurality of incoming optical links;

wherein each of said incoming optical links are connected to a selected one of the lasers.

9. The system as in claim 3,

wherein each input port consists of at least one star coupler.

10. The system as in claim 3,

wherein each star coupler is used by at least one input port.

11. The system as in claim 3,

wherein each output port consists of at least one WDM MUX.

12. The system as in claim 3,

wherein each WDM MUX is used by at least one output port.

13. The system as in claim 3,

wherein selected ones of the lasers are tunable lasers; and

wherein each of the switch controllers is responsive to the CTR for tuning the tunable lasers for transmitting data units on a predefined optical channel.

14. The system as in claim 3,

wherein for each time frame within the time cycle each of the tunable receivers is tuned by the switch controllers for receiving data units on a predefined optical channel.

15. The system as in claim 3,

wherein for each time frame within the super cycle each of the tunable receivers is tuned by the switch controllers for receiving data units on a predefined optical channel.

16. The system as in claim 13,

wherein for each time frame within the time cycle each of the tunable lasers is tuned by the switch controllers for transmitting data units on a predefined optical channel.

17. The system as in claim 13,

wherein for each time frame within the super cycle each of the tunable lasers is tuned by the switch controllers for transmitting data units on a predefined optical channel.

18. The system as in claim 3,

wherein the plurality of input ports each receives data units over at least one of a plurality of incoming channels (*j*); and

wherein each of the incoming channels (*j*) has a unique time reference (UTR-j) that is phase independent of the CTR.

19. The system as in claim 18, further comprising of a plurality of alignment subsystems;

wherein the UTR-j is divided into UTR-j super cycles (SC); wherein the UTR-j super cycles are divided into UTR-j time cycles (TC); and wherein the UTR-j time cycles are divided into UTR-j time frames (TF); and

wherein a respective one of the alignment subsystems aligns UTR-j to CTR, according to at least one of the following: UTR-j TF to CTR TF, UTR-j TC to CTR TC, UTR-j SC to CTR SC.

20. The system as in claim 19,

wherein the alignment subsystem is located before each input of the star coupler.

21. The system as in claim 19,

wherein the alignment subsystem is located between the output of the tunable receiver and the input of the laser.

22. The system as in claim 1, further comprising means for deriving the CTR from a Coordinated Universal Time (UTC) standard, wherein the super cycle is one of a single UTC second, a predefined integer number of UTC seconds, and a fraction of one UTC second.

23. The system as in claim 22, further comprising means for obtaining the UTC via at least one of the following: Global Positioning System (GPS), Global Navigation Satellite System – GLONASS, and Galileo.

24. The system as in claim 1,

wherein the optical interconnection system is further comprised of:

a plurality of optical alignment subsystems, a plurality of star couplers, a plurality of wavelength converters (WLC), and a plurality of WDM MUXs; and

wherein each of the switch controllers is responsive to the CTR for tuning the WLCs for converting from a first predefined wavelength to a second predefined wavelength.

25. The system as in claim 24,

wherein the communications links are coupled to the optical alignment subsystems;

wherein the optical alignment subsystems are coupled to the star couplers;

wherein the star couplers are coupled to the WLCs; and

wherein the WLCs are coupled to the WDM MUXs.

26. The system as in claim 1,

wherein the optical interconnection system is further comprised of:

a plurality of optical alignment subsystems, a plurality of star couplers, a plurality of tunable receivers, a plurality of lasers, a plurality of optical cross connects (OXCs), and a plurality of WDM MUXs;

wherein each of the switch controllers is responsive to the CTR for tuning the tunable receivers for receiving data units on a predefined optical channel; and

wherein each of the switch controllers is responsive to the CTR for configuring the OXCs.

27. The system as in claim 26,

wherein the communications links are coupled to the optical alignment subsystems;

wherein the optical alignment subsystems are coupled to the star couplers;

wherein the star couplers are coupled to the tunable receivers;

wherein the tunable receivers are coupled to the lasers;

wherein the lasers are coupled to the OXCs; and

wherein the OXCs are coupled to the WDM MUXs.

28. The system as in claim 26,

wherein each of the OXCs is at least one of: an optical cross-bar, an optical banyan network, a Lithium-Niobate optical switch, an Indium Phosphate optical switch, a 2-D MEMS optical switch, a 3-D MEMS optical switch, a semiconductor optical amplifier (SOA) based optical switch, an holographic optical switch, and bubble optical switch..

29. The system as in claim 1, further comprising:

a plurality of optical alignment subsystems, a plurality of star couplers, a plurality of wavelength converters (WLC), a plurality of star couplers for broadcast, a plurality of first WDM MUXs, a plurality of filters, and a plurality of second WDM MUXs;

wherein each of the switch controllers is responsive to the CTR for tuning the WLCs for converting from a first predefined wavelength to a second predefined wavelength; and

wherein each of the switch controllers is responsive to the CTR for configuring the optical interconnection system.

30. The system as in claim 29,

wherein the communications links are coupled to the optical alignment subsystems; wherein the optical alignment subsystems are coupled to the star couplers;

wherein the star couplers are coupled to the WLCs;

wherein the WLCs are coupled to the star couplers;

wherein the star couplers are coupled to the first WDM MUXs;

wherein the WDM MUXs star couplers are coupled to the filters; and

wherein the filters are coupled to the second WDM MUXs.

31. The system as in claim 29,

wherein each of the WLCs are further comprised of a tunable receiver and a tunable laser; and

wherein the tunable receiver and the tunable laser are controlled responsive to the CTR.

32. A switching system comprising:

a common time reference (CTR);

a plurality of optical links, each carrying a plurality of optical channels, wherein each of the optical channels is carried on a defined first wavelength;

a plurality of wavelength conversion subsystems each coupled to a respective one of the plurality of optical links;

wherein each wavelength conversion subsystem selectively converts from the first wavelength to a second wavelength, responsive to the CTR, to provide a respective output of a second optical link carrying the second wavelength;

a plurality of wavelength division multiplexers (WDM's), each having a plurality of optical channel inputs;

an optical interconnection subsystem for coupling the second optical links to selected ones of the optical channel inputs of an associated one of the WDM's; and

wherein each of the WDM's multiplexes its respective plurality of optical channel inputs to at least one respective output optical link.

33. The system as in claim 32, wherein the CTR is comprised of a plurality of time frames, wherein the wavelength conversion subsystem is further comprised of:

a Wavelength Conversion (WLC) scheduling controller comprising a wavelength mapping table defining the associative mapping between the first wavelength and the second wavelength for each of the time frames; and

a tunable wavelength conversion subsystem for converting, for each of the time frames, the first wavelength into the second wavelength, responsive to the WLC scheduling controller.

34. The system as in claim 33, wherein the tunable wavelength conversion subsystem is further comprised of:

a tunable receiver, responsive to the WLC scheduling controller, for providing an electrical signal representative of the first wavelength; and

a laser, responsive to the electrical signal output, for transmitting as an output an optical signal of the second wavelength representative of the first wavelength.

35. The system as in claim 34, wherein the laser is a tunable laser, responsive to the WLC scheduling controller, for providing an optical output of the second wavelength.

36. The system as in claim 33, further comprising:

an alignment subsystem coupled between the tunable receiver and the laser, responsive to the CTR, for aligning a beginning of each of the time frames with the CTR.

37. The system as in claim 32, wherein the optical interconnection system is a fixed set of fiber connections.

38. The system as in claim 32, wherein the optical interconnection system is programmable.

39. The system as in claim 38, wherein the programmable optical interconnection system is comprised of an optical cross-connect (OXC), and is responsive to the CTR.

40. The system as in claim 39, wherein each of the OXCs is at least one of: an optical cross-bar, an optical banyan network, a Lithium-Niobate optical switch, an Indium Phosphate optical

switch, a 2-D MEMS optical switch, a 3-D MEMS optical switch, a semiconductor optical amplifier (SOA) based optical switch, an holographic optical switch, and bubble optical switch..

41. A switching system comprising:

a common time reference (CTR);

a plurality of optical links, each carrying a plurality of optical channels, wherein each of the optical channels is carried on a defined first wavelength;

a plurality of multiple wavelength conversion subsystems (MWLC) each coupled to a respective one of the plurality of optical links;

wherein each of the MWLC selectively converts from multiple ones of first wavelengths to respective multiple ones of second wavelengths, responsive to the CTR, wherein each of the MWLC's provides a respective output of a second optical link carrying multiple ones of the second wavelengths; and

a wavelength grafting router for coupling each of the wavelengths carried on the second optical link to at least one respective optical link output.

42. The system as in claim 41, wherein the CTR is comprised of a plurality of time frames, wherein the MWLC is further comprised of:

a MWLC scheduling controller responsive to the CTR for defining the associative mapping between the first ones of multiple wavelengths and the second ones of multiple wavelengths for each of the time frames; and

a tunable multiple wavelength conversion subsystem for converting, for each of the time frames, the first ones of multiple wavelengths into the second one of multiple wavelengths responsive to the MWLC scheduling controller.

43. The system as in claim 42, wherein the tunable multiple wavelength conversion subsystem is further comprised of:

a wavelength division demultiplexer (WDD), a plurality of tunable wavelength conversion subsystems (TWLCS), and a wavelength division multiplexer (WDM),

wherein each tunable wavelength conversion subsystem converts, for each of the time frames, a first wavelength into a second wavelength responsive to the MWLC scheduling controller.

44. The system as in claim 43, wherein the tunable wavelength conversion subsystem is further comprised of:

a tunable receiver, responsive to the WLC scheduling controller, for providing an electrical signal representative of the first wavelength; and

a laser, responsive to the electrical signal output, for transmitting as an output an optical signal of the second wavelength representative of the first wavelength.

45. The system as in claim 44, wherein the laser is a tunable laser for providing an optical output of the second wavelength.

46. The system as in claim 44, further comprising:

an alignment subsystem coupled between the tunable receiver and the laser, responsive to the CTR, for aligning a beginning of each of the time frames with the CTR.

47. The system as in claim 42, wherein the tunable multiple wavelength conversion subsystem is further comprised of:

a star coupler, a plurality of tunable wavelength conversion subsystems (TWLCS), and a wavelength division multiplexer (WDM); and

wherein each tunable wavelength conversion subsystem converts, for each of the time frames, a first wavelength into a second wavelength responsive to the MWLC scheduling controller.

48. The system as in claim 47, wherein the tunable wavelength conversion subsystem is further comprised of:

a tunable receiver, responsive to the WLC scheduling controller, for providing an electrical signal representative of the first wavelength; and

a laser, responsive to the electrical signal output, for transmitting as an output an optical signal of the second wavelength representative of the first wavelength.

49. The system as in claim 48, wherein the laser is a tunable laser for providing an optical output of the second wavelength.

50. The system as in claim 48, further comprising:

an alignment subsystem coupled between the tunable receiver and the laser, responsive to the CTR, for aligning a beginning of each of the time frames with the CTR.

51. A switching method for a switching system having an input and an output, said switching system further comprising a first communications switch and a second communications switch connected by at least one communications link, comprising at least one channel, for transmitting a plurality of data units through said communications link to the output of the switching system, wherein each of the communications switches is further comprised of a plurality of input ports

and a plurality of output ports, each of the input ports connected to and receiving data units from the communications link over at least one of the channels, and each of the output ports connected to and transmitting data units to the communications link over at least one of the channels, wherein each of the communications switches has an optical interconnection system coupled to the respective switch controller, the respective input ports, and the respective output ports, the method comprising:

providing a common time reference (CTR);

dividing the CTR into a plurality of contiguous periodic super cycles (SCs) each comprised of at least one time cycle (TC) each comprised of at least one time frame (TF);

defining the coupling from each one of the respective input ports for data units received during any one of the time frames, on a respective one of the channels, for output during a predefined time frame to at least one selected one of the respective output ports on at least one selected respective one of the channels; and

configuring the optical interconnection system for coupling to the input ports via a wavelength conversion subsystem.

52. The method as in claim 51, further comprising:

outputting the data units during a first predefined time frame on a selected respective one of the channels from the respective output port of the first communications switch; and

forwarding the data units from the respective output port of the second communications switch during a second predefined time frame on a selected respective one of the channels responsive to the CTR.

53. The method as in claim 51, wherein the optical interconnection system is further comprised of a plurality of tunable receivers, the method further comprising:

tuning the tunable receivers for receiving data units on a predefined optical channel responsive to the CTR.

54. The method as in claim 53,

wherein the communications links are coupled to star couplers;

wherein the star couplers are coupled to the tunable receivers;

wherein the tunable receivers are coupled to lasers; and

wherein the lasers are coupled to a plurality of Wavelength Division Multiplexers (WDM MUX).

55. The method as in claim 54, further comprising:

dividing the communications links into a plurality of subsets; and

coupling each of the subsets of the communications links to each of the star couplers.

56. The method as in claim 54, wherein each star coupler has a plurality of outgoing optical links, the method further comprising:

connecting each of said outgoing optical links to a selected one of the tunable receivers.

57. The method as in claim 54, wherein each of the WDM MUX has a plurality of incoming optical links, the method further comprising:

connecting each of said incoming optical links to a selected one of the lasers.

59. The method as in claim 53, further comprising:

tuning, for each time frame within the time cycle, each of the tunable receivers for receiving data units on a predefined optical channel.

61. The method as in claim 51, wherein the optical interconnection system is further comprised of a plurality of optical alignment subsystems, a plurality of star couplers, a plurality of wavelength converters (WLC), and a plurality of WDM MUXs, the method further comprising:

tuning the WLCs for converting from a first predefined wavelength to a second predefined wavelength responsive to the CTR.

62. The method as in claim 61,

wherein the communications links are coupled to the optical alignment subsystems;

wherein the optical alignment subsystems are coupled to the star couplers;

wherein the star couplers are coupled to the WLCs; and

wherein the WLCs are coupled to the WDM MUXs.

63. The method as in claim 51, wherein the optical interconnection system is further comprised of a plurality of optical alignment subsystems, a plurality of star couplers, a plurality of tunable receivers, a plurality of lasers, a plurality of optical cross connects (OXCs), and a plurality of WDM MUXs, the method further comprising:

tuning the tunable receivers for receiving data units on a predefined optical channel responsive to the CTR; and

configuring the OXCs responsive to the CTR.

64. The method as in claim 63,

wherein the communications links are coupled to the optical alignment subsystems;

wherein the optical alignment subsystems are coupled to the star couplers;

wherein the star couplers are coupled to the tunable receivers;

wherein the tunable receivers are coupled to the lasers;

wherein the lasers are coupled to the OXCs; and

wherein the OXCs are coupled to the WDM MUXs.

65. The method as in claim 51, wherein the optical interconnection system is further comprised of a plurality of optical alignment subsystems, a plurality of star couplers, a plurality of wavelength converters (WLC), a plurality of star couplers for broadcast, a plurality of first WDM MUXs, a plurality of filters, and a plurality of second WDM MUXs, the method further comprising:

tuning the WLCs for converting from a first predefined wavelength to a second predefined wavelength responsive to the CTR; and

configuring the optical interconnection system responsive to the CTR.

66. The method as in claim 65,

wherein the communications links are coupled to the optical alignment subsystems; wherein the optical alignment subsystems are coupled to the star couplers;

wherein the star couplers are coupled to the WLCs;

wherein the WLCs are coupled to the star couplers;

wherein the star couplers are coupled to the first WDM MUXs;

wherein the WDM MUXs star couplers are coupled to the filters; and

wherein the filters are coupled to the second WDM MUXs.

67. The method as in claim 65, wherein each of the WLCs are further comprised of a tunable receiver and a tunable laser, the method further comprising:

controlling the tunable receiver and the tunable laser responsive to the CTR.